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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PPS0025 – INTRODUCTION TO PROBABILITY AND STATISTICS

(Foundation in Business)

1 JUNE 2017

9.00 a.m. – 11.00 a.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages with **FOUR** questions.
2. Attempt **ALL** four questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.
4. **Formula** is provided at the back of the question paper.
5. **Statistical table** is provided.

Question 1

- a. A company produces bags of cypress mulch. The weight in pounds per bag varies, as indicated in the accompanying table.

Weight in Pounds (X)	44	45	46	47	48	49	50
Proportion of bags, $P(X)$	0.04	0.13	0.21	0.29	0.20	0.10	0.03

- i. Calculate the cumulative probability function, $F(X)$. (2 marks)
- ii. What is the probability that X is an even number? (2 marks)
- iii. What is the probability that a randomly chosen bag will contain between 45 and 49 pounds of mulch? (2 marks)
- iv. Compute the expected number of the weight per bag. (3 marks)
- v. Compute the standard deviation. (4 marks)

b.
$$f(y) = \begin{cases} \frac{1}{2}k(3-y), & 0 < y \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

- i. Evaluate k . (4 marks)
- ii. Evaluate $P(0.5 < y < 1.5)$. (3 marks)
- iii. Compute the mean of $f(y)$. (5 marks)

(Total = 25 marks)

Question 2

- a. According to a survey, 72% of adults believe that every college student should be required to take at least one course in ethics. Assume that this percentage is true for the current population of all adults. In a random sample of 14 adults, find the probability that
- i. exactly 10 of them believe that every college student should be required to take at least one course in ethics. (4 marks)
 - ii. 3 to 12 of them believe that every college student should be required to take at least one course in ethics. (4 marks)
 - iii. at least 8 of them **DO NOT** believe that every college student should be required to take at least one course in ethics. (3 marks)
- b. A commuter airline receives an average of 8 complaints per week from its passengers.
- i. What is the probability that at most 17 complaints received in 10 days? (3 marks)
 - ii. What is the probability that between 9 to 22 complaints received in 2 weeks? (5 marks)
 - iii. Find the mean number of complaints received in a given day? (2 marks)

Continued...

- c. The transmission on a model of a specific car has a warranty for 40,000 miles. It is known that the life of such a transmission has a normal distribution with a mean of 72,000 miles and a standard deviation of 12,000 miles. What is the probability of the transmission will fail before the end of the warranty period?
(4 marks)

(Total = 25 marks)

Question 3

- a. The following data give the ages of all six members of a family.

54 52 27 24 20 14

List all the possible samples of size five (without replacement) from this population and construct the sampling distribution of the sample mean. Then, find the sampling error for each sample.

(15 marks)

- b. The weekly earnings of all employees of a company have a normal distribution with a mean of RM440 and a standard deviation of RM48.
- What is the mean, and the standard deviation of the mean weekly earnings of a random sample of 100 employees selected from this company?
(3 marks)
 - What is the probability that the mean of 100 employees is less than RM447?
(2 marks)
 - What is the probability that the mean of 38 employees is between RM432 and RM454?
(5 marks)

(Total = 25 marks)

Continued...

Question 4

- a. The administrative office of a hospital claims that the mean waiting time for patients to get treatment in its emergency ward is 25 minutes. A random sample of 45 patients who received treatment in the emergency ward of this hospital produced a mean waiting time of 29.5 minutes with a standard deviation of 5.2 minutes. Assume that the waiting times for all patients at this emergency ward have a normal distribution.
- i. Construct a 98% confidence interval of μ . (5 marks)
 - ii. Using the 3% significance level, test whether the mean waiting time at the emergency ward is different from 25 minutes. (10 marks)
- b. The management of a health club claims that its members lose an average of 10.2 pounds or more within the first month after joining the club. A consumer agency that wanted to check on this claim took a random sample of 34 members of this health club and found that they lost an average of 9.3 pounds within the first month of membership with a standard deviation of 2.6 pounds. Can you conclude that the claim is true at the 0.005 significance level? (10 marks)

(Total = 25 marks)

End of page

Formulae:

1.

	Mean	Variance
Discrete Random Variable X	$\mu = E(X)$ $= \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ where $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X)$ $= \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ where $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \frac{e^{-\lambda} \lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3. The z value for a value of x : $z = \frac{x - \mu}{\sigma}$

4. The z value for a value of \bar{x} : $z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

5. Sampling error = $\bar{x} - \mu$

Non-sampling error = incorrect \bar{x} - correct \bar{x}

6. Point estimate of $\mu = \bar{x}$

Margin of error = $\pm 1.96\sigma_{\bar{x}} = \pm 1.96 \frac{\sigma}{\sqrt{n}}$ or $= \pm 1.96s_{\bar{x}} = \pm 1.96 \frac{s}{\sqrt{n}}$

7. The $(1 - \alpha)100\%$ confidence interval for μ is

$\bar{x} \pm z\sigma_{\bar{x}}$ if σ is known

$\bar{x} \pm zs_{\bar{x}}$ if σ is not known

where $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \frac{s}{\sqrt{n}}$